

CLAIMS

What is claimed is:

1. An adjustable down-hole tool comprising:

a body having a through bore;

a mandrel axially movable and rotationally fixed in the body, the mandrel being movable by fluid pressure in the tool against the action of a first return spring between two positions, one being a first, deactivated position and another being a second, activated position;

a sleeve, said sleeve limiting movement of said mandrel between said positions;

at least two sets of castellations, one set on the sleeve and the other set on an edge of the mandrel or body facing the castellations on the sleeve so that, when the castellations are in phase, the mandrel is prevented from travelling from said first to second position and when they are out of phase they interdigitate and the mandrel is not prevented from travelling from said first to second position; and

means to rotate the sleeve relative to the facing edge between said in-phase and out-of-phase positions; wherein

said means comprises a control piston slidable relative to the mandrel and the body by fluid pressure in the tool against the action of a second return spring and in which said piston is axially slidable with respect to said sleeve and rotationally coupled therewith.

2. An adjustable down-hole tool comprising:

a body having a through bore;

a mandrel axially movable in the body, the mandrel being movable by fluid pressure in the tool against the action of a first return spring between two positions, one being a first, deactivated position and another being a second, activated position;

a shoulder on the body;

a sleeve, said sleeve being between the shoulder and the mandrel;

at least two sets of castellations, one set on one of said shoulder and mandrel and the other set on a facing edge or edges of the sleeve so that, when the castellations are in phase, the mandrel is prevented from travelling from said first to second position and when they are out of phase they interdigitate and the mandrel is not prevented from travelling from said first to second position; and

means to rotate the sleeve relative to the mandrel between said in-phase and out-of-phase positions; wherein

said means comprises a control piston slidable with respect to the mandrel and the body by fluid pressure in the tool against the action of a second return spring; and wherein

one of said piston and mandrel is rotationally fixed with respect to the body.

3. An adjustable down-hole tool comprising:

a body having a through bore;

a mandrel having a through bore axially movable in the body, the mandrel being movable by fluid pressure in the tool against the action of a first return spring between two positions, one being a first, deactivated position and another being a second, activated position;

a sleeve between the body and mandrel limiting movement of said mandrel between said positions;

at least two sets of castellations, one set on the sleeve and the other set on a facing edge of the body or mandrel so that, when the castellations are in phase, the mandrel is prevented from travelling from said first to second position and, when they are out of phase, they interdigitate and the mandrel is not prevented from travelling from said first to second position; and

a control piston to rotate the sleeve relative to said facing edge between said in-phase and out-of-phase positions, the piston being movable by fluid pressure in the tool against the action of a second return spring; wherein

said control piston is slidable in the mandrel, the mandrel carrying rotation transmitters that are in contact with both the piston and sleeve, whereby rotation of the piston relative to the mandrel rotates the sleeve relative to the mandrel.

4. A tool as claimed in claim 3, in which said rotation transmitters are carried by the mandrel intermediate its ends.

5. A tool as claimed in claim 4, in which said rotation transmitters are between axially spaced seals of the piston against the bore of the mandrel.

6. A tool as claimed in claim 3, in which said rotation transmitters comprise a gear rotationally journaled in the mandrel about an axis parallel the throughbores, both the piston and sleeve having a rack engaged with the gear.

7. A tool as claimed in claim 6, in which a plurality of said gears are disposed around the circumference of the mandrel.

8. A tool as claimed in claim 3, in which said tool is a drill-string stabiliser and said mandrel has wedge surfaces to engage corresponding surfaces on radially disposed pistons slidable in the body, whereby, when the mandrel moves from said deactivated to said activated position, the pistons extend from the body increasing the working diameter of the stabiliser.

9. A tool as claimed in claim 3, in which a circumferential barrel cam is defined in one of said piston and mandrel, a cam follower being disposed in the other of said piston and mandrel, the follower being within the barrel cam so that axial movement of the piston with respect to the mandrel results in corresponding rotation of the piston with respect to the mandrel.

10. A tool as claimed in claim 9, in which a separate component of the piston is rotationally freely, but axially fixedly, mounted in the piston, which component carries said barrel cam or follower, said separate component driving said rotation transmitters on rotation of said component in response to axial movement of the piston in said mandrel.

11. A tool as claimed in claim 9, in which said tool is a drill-string stabiliser and said mandrel has wedge surfaces to engage corresponding surfaces on radially disposed pistons slidable in the body, whereby, when the mandrel moves from said deactivated to said activated position, the pistons extend from the body increasing the working diameter of the stabiliser, and in which the barrel cam is shaped so that movement of the piston in one axial stroke and return thereof results in relative rotation of the sleeve and said facing edge from a said in-phase position to a said out-of-phase position or vice versa.

12. A tool as claimed in claim 11, in which said castellations are angularly spaced by a phase angle and said stroke and return of the piston results in relative rotation of the sleeve and said facing edge by said phase angle.

13. A tool as claimed in any of claim 9, in which said follower is a pin that has a relatively thin diameter end, and said barrel cam comprises a wide groove to receive a large diameter section of the pin and a deeper, narrow groove within said wide groove to receive said thin end of the pin.

14. A tool as claimed in claim 3, in which one set of said castellations comprise an even number of alternating fingers and slots, and in which alternate fingers are longer than the remaining fingers, and the other set of castellations comprise the same number of alternating fingers and slots, and in which alternate slots are shorter than the remaining slots, whereby an intermediate position of the mandrel is defined when said longer fingers interdigitate with said shorter slots.

15. A tool as claimed in claim 3, in which, when said mandrel is in said deactivated position, a rise in hydraulic pressure in the tool results in movement of the piston before movement of the mandrel.

16. A tool as claimed in claim 3, in which said first return spring is sufficiently stronger than said second return spring to ensure that, when said mandrel is in said deactivated position, a rise in hydraulic pressure in the tool results in movement of the piston before movement of the mandrel.

17. A tool as claimed in claim 3, in which a spring loaded detent between said mandrel and body retains the mandrel in said deactivated position until a threshold hydraulic pressure has been exceeded, which pressure is greater than that required to move said piston.
18. A tool as claimed in claim 17, in which said detent comprises a plunger in a radial bore of the mandrel or body, spring biased against a lip of the body or mandrel respectively.
19. A tool as claimed in claim 18, in which said lip is of a circumferential groove around the mandrel.
20. A tool as claimed in claim 17, comprising a plurality of said detents arranged around the circumference of the mandrel.
21. A tool as claimed in claim 3, in which the mandrel is sealed to the body about first and second circumferences, the first being a larger circumference upstream, in terms of fluid flow through the tool, of the second, smaller circumference.
22. A tool as claimed in claim 3, in which the piston has a through bore and is sealed to the mandrel about third and fourth circumferences, the third being a larger circumference upstream, in terms of fluid flow through the tool, of the fourth, smaller circumference.